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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/696,049

10/29/2003

Heping Dai

TI-36527

5830

23494

7590

09/10/2004

TEXAS INSTRUMENTS INCORPORATED
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EXAMINER

KITOV, ZEEV

ART UNIT

PAPER NUMBER

2836

DATE MAILED: 09/10/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/696,049

Applicant(s)

DAI ET AL.

Examiner

Zeev Kitov

Art Unit

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 29 October 2003.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1- 20 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1 - 20 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 23 April 2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter, which the applicant regards as his invention.

Claims 1 and 11 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. A reason for that is that the claims recite "the voltage at the shunt resistor". As well known in the art, the voltage is a difference of potentials, which is measured between two points of the circuit. The second, the reference point, sometime is omitted when the voltage is measured with reference to a ground. However, in current Application it does not seem to be the case. For purpose of examination it was interpreted as "the voltage across the shunt resistor".

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1, 2, 4, 7, 11, 12, 14 and 17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Smith et al. (US 6,014,030) in view of Ogasawara (US 5,001,928).

Regarding Claims 1 and 11, Smith et al. disclose most of the elements of the claims

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including a switch (elements M103, M104 in Fig. 4b) connected to the power supply and a load; a control circuit (elements 115, 116, 109 in Fig. 4b) connected to the power supply source (element 101 in Fig. 4b) and to the load side of the switch (terminal 118 in Fig. 4b), wherein the control circuit monitors the voltage across the switch and limits the current through the switch when exceeding a current limit set by the reference elements (elements 113, 114, 107 in Fig. 4b, col. 7, lines 33 – 40). However, it does not disclose the shunt resistor connected to the control circuit. Ogasawara discloses the shunt resistor (element Rd in Fig. 1) connected to the input of the operational amplifier (element OP1 in Fig. 1) analogous to the operational amplifiers (elements 115, 116 and 109 in Fig. 4b of Smith). This resistor is to be connected in series with the operational amplifier input, i.e. to the supply node (element 121 in Fig. 4b of Smith et al.). Then changing a value of the shunt resistor would affect the threshold of the switch activation satisfying the following claim limitation: “a current limit set by the shunt resistance as determined by the voltage at the shunt resistor and the voltage at the switch”. Both references have the same problem solving area, namely providing temperature compensation to the electronic equipment. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have modified the Smith et al. solution by adding the shunt resistance according to Ogasawara, because as Smith et al. state col. 10 – line 20 – col. 11, line 43), for precision operation of the circuit the temperature dependence of the switching threshold should be compensated.

Regarding Claims 2, 4, 12 and 14 as one can see, the only way to connect the additional shunt resistor to the circuit of Fig. 4b of Smith et al. is to the supply side of the

switch (to the node 121 in Fig. 4b of Smith et al.), which is the low side of the supply. As to motivation for modification of the primary reference, see above.

Regarding Claims 7 and 17, Smith et al. disclose N-channel FET transistor (elements M103 and M104 in Fig. 4b).

Claims 3 and 13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Smith et al. in view of Ogasawara and Court Decision *In re Japikse*, 181 F.2d 1019, 86 USPQ 70 (CCPA 1950). As was stated above, Smith et al. and Ogasawara disclose all the elements of Claims 1 and 11. However, regarding Claims 3 and 13, they do not disclose the first terminal of the resistor being connected to the load side of the switch, rather than to the battery side of the switch. A criticality of the shunt resistor connection near the load side of the switch was not disclosed. Being on either side of the switch it would perform the same way. The Court Decision stating that rearranging parts of an invention involves only routine skill in the art addressed this issue. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have further modified the Smith et al. solution by moving the shunt resistor connection from the battery side of the switch to the load side of the switch, since it has been held that rearranging parts of an invention involves only routine skill in the art.

Claims 9, 10, 19 and 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Smith et al. in view of Ogasawara and modern design practice. As was stated above, Smith et al. and Ogasawara disclose all the elements of Claims 1

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and 11. However, regarding Claims 9 and 19, they do not disclose the circuit incorporated in an integrated circuit. Examiner takes an Official Notice that in modern design practice it is widely used to incorporate all circuit elements (except some, which is difficult to integrate) into integrated circuit package. The shunt resistor should be integrated because it should be placed as close as possible to the switching transistors for better sensing their temperature; the adjustment resistor should not be integrated because otherwise setting the value of the resistor would be possible. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have further modified the Smith et al. solution by incorporating most of the electronic components, except the shunt resistor and adjustment resistor, into the integrated circuit because as well known in the art, the integration would bring some substantial advantages, such as saving the space, increase in reliability and saving an assembly cost.

Claims 3, 5, 6, 8, 13, 15, 16 and 18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Smith et al. in view of Ogasawara and A. Sedra et al. textbook Microelectronic Circuits. As was stated above, Smith et al. and Ogasawara disclose all the elements of Claims 1 and 11. However, regarding Claims 5, 8 and 15 and 18, they do not disclose a P-channel FET transistor and the switch being connected to the high side of the supply. A. Sedra et al. textbook Microelectronic Circuits discloses N-channel and P-channel MOSFET's as being complementary quite similar elements but having complementary polarity (pages 342 – 345). As shown in Recapitulation (Fig. 7.17, page

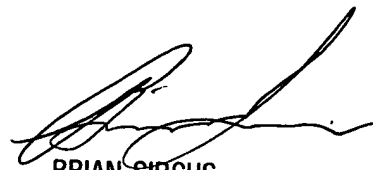
345), the P-channel and N-channel MOSFET's are mutually replaceable with some minor circuit adjustment. Selection of particular device for design is a routine task for designer. Therefore the P-channel MOSFET with a change of the battery terminals polarity can replace the N-channel MOSFET device of Smith et al. As a result, the switch will be connected to the high side of the power supply. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have further modified the Smith et al. solution by changing the N-channel MOSFET to the P-channel MOSFET and reversing connection of the battery terminals, because as Sedra et al. textbook shows the N-channel and P-channel MOSFET's are substantially equivalent devices different only by their polarity and designer selects a particular type of the device according to his convenience.

Regarding Claims 6 and 16, Smith et al. disclose the current source as a linear temperature dependent source (Fig. 5a, col. 10, line 20 – col. 11, line 43). Ogasawara discloses a current source (element 1 in Fig. 1) that sets a bias voltage drop across the shunt resistor (element R_d in Fig. 1). In the Smith et al. system modified according to Ogasawara the current source will fulfill its role stated by Smith et al., i.e. compensating for variation of switch on resistance ($R_{DS(on)}$) versus temperature. An evidence for that is that resistor R_f (Fig. 3) later shown as element 102 (Fig. 5a), which is temperature dependent and requires the temperature compensation, includes the $R_{DS(on)}$ (col. 5, lines 13 – 19).

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Zeev Kitov whose current telephone number is (571) 272 - 2052. The examiner can normally be reached on 8:00 – 4:30. If attempts to reach examiner by telephone are unsuccessful, the examiner's supervisor, Brian Sircus can be reached on (571) 272 – 2800, Ext. 36. The fax phone number for organization where this application or proceedings is assigned is (703) 872-9306 for all communications.

Z.K.
09/01/2004



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